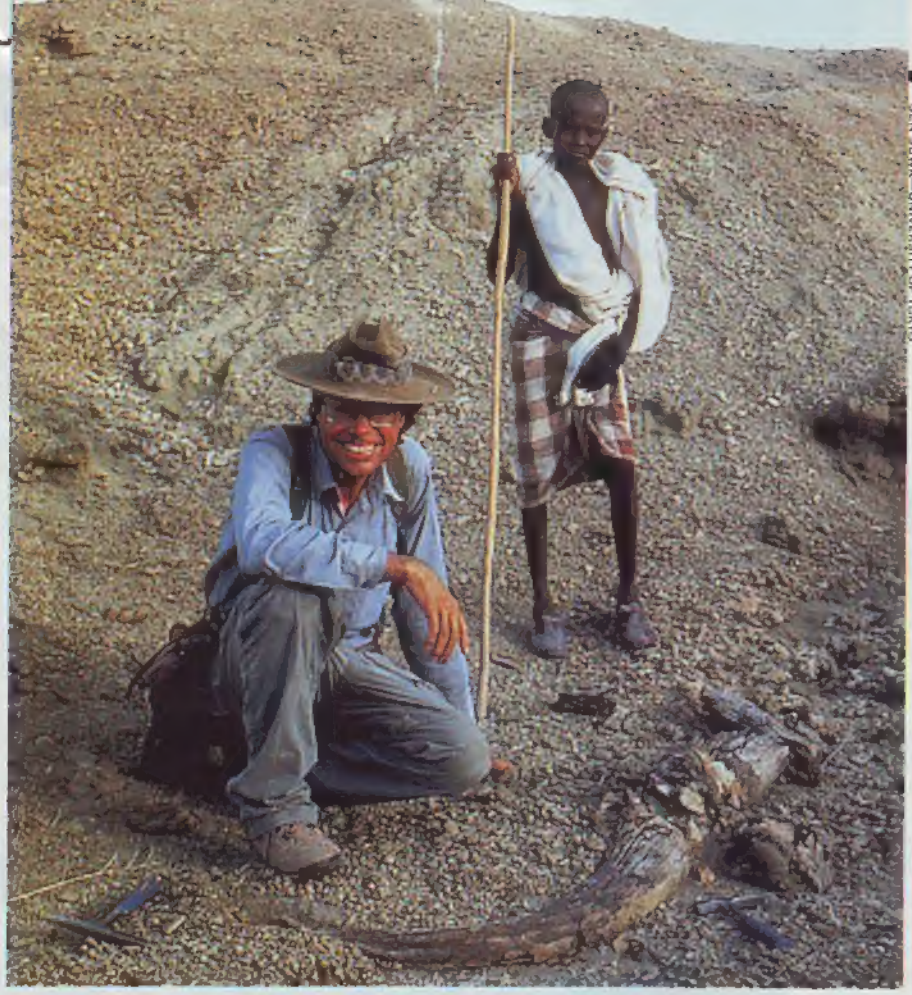


GEN SUWA—UNIVERSITY OF TOKYO

HUMANITY'S CRADLE: White and a local resident near the site where fossils from a previously unknown species were found

SCIENCE

One Less Missing Link

Bones from the Ethiopian desert prove that human ancestors walked the earth 4.4 million years ago

By MICHAEL D. LEMONICK

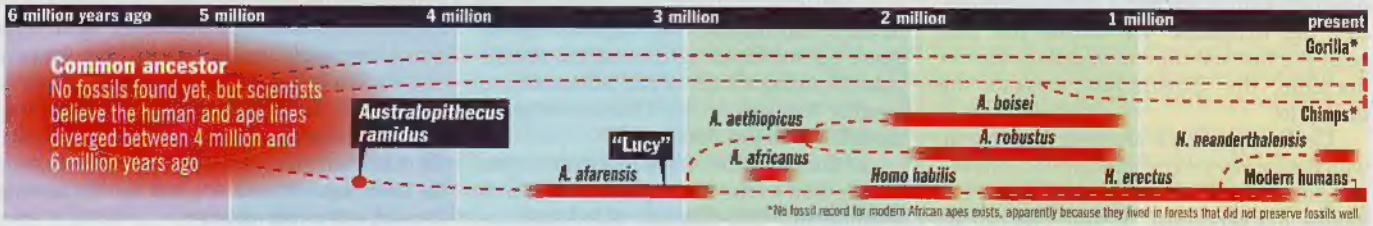
PALEONTOLOGIST GEN SUWA WAS walking across the pebble-covered desert of north-central Ethiopia under the searing midday sun, peering carefully around him for ancient bones. Then he saw it: the telltale gleam of a fossil tooth partially exposed on the rocky ground. "I knew immediately that it was a hominid tooth," says the University of Tokyo scientist, "and one of the oldest ever found."

It was more than that. Suwa had uncovered nothing less than a new chapter in the history of human evolution. He and his colleagues report in the current *Nature* that the archaic molar, along with other fossils they found in the area on expeditions in 1992 and 1993, belong to a previously unknown species. This diminutive, humanlike creature walked the earth some 4.4 million years ago—half a million years earlier than the oldest human ancestors ever identified. That stretches our family tree back almost to the era when humans and apes branched off from a single ancestor. In fact, says University of Liverpool paleontologist Bernard Wood, whose commentary on the find also appears in *Nature*: "It looks to me like this is either the common ancestor or damned close to it. I think we're splitting hairs not to call it the 'missing link.'"

Paleoanthropologists have not unearthed anything this revolutionary since 1974, when the famous fossil skeleton known as Lucy was discovered about 80 km north of the current find. That 3.2 million-year-old female hominid had some human characteristics—most notably, she walked on two legs rather than four—but skull and tooth fragments indicated she was somewhat apelike as well. She fit nicely into the shared-ancestor theory first put forward by Charles Darwin and supported by modern comparisons between human and ape proteins and DNA. The divergence between the ape and human lines, argued the biochemists, came somewhere between 4 million and 6 million years ago. Some paleontologists predicted that as hominid species were discovered from periods closer and closer to the time of the actual split, they should be even more apelike than Lucy.

That's exactly the case with the new species, which now bears the scientific name *Australopithecus ramidus* (*ramid* means root in the local Afar language). Like Lucy and her clan, known as *Australopithecus afarensis*, *ramidus* had teeth with some apelike and some human characteristics. But at least one specimen—a baby molar still attached to a piece of an immature *ramidus* jaw—resembles a chimpanzee tooth more than a molar from any known hominid. "It's obvious that it belongs to an ancestor of *afarensis*," says Tim White of the University of California, Berkeley, a co-author of the *Nature* report and a leader of the international team that uncovered the new fossils.

The researchers found very few bones from below the neck, and those they found were in fragments; chew marks on the bones show that the hominids' carcasses were ravaged by carnivores. That makes it hard for anyone to be sure what these creatures looked like and how they walked. The fossils suggest that at least some members of the *ramidus* clan were about 1.2 m tall,



but that doesn't establish what the range in height was. In some African apes, males are considerably bigger than females, as they were in Lucy's species as well. Says White: "We do know the arm bones come from an individual that was larger than Lucy, but we don't know if it was male or female."

Most experts assume *ramidus* walked on two legs, as Lucy did, but the evidence is skimpy and indirect. One clue is a tiny fragment of the foramen magnum, the opening at the base of the skull where the spinal cord joins the brain: its location suggests an upright stance. Moreover, the structure of the arm bones is different from what anatomists see in knuckle-walking apes.

If *ramidus* really did travel on two legs, anthropologists may have to rethink their notions of what started pre-hominids on the evolutionary road that led to modern *Homo sapiens*. It is already clear from Lucy, who stood upright but had an apelike skull, that bipedalism came first and a large brain later. But what prompted the shift to two-leggedness? The conventional theory is that a change in climate transformed the eastern and southern African forests to dry, open grasslands, favoring apes that could walk upright; they would have been able to see predators from farther away and walk long distances holding food or children.

It appears *ramidus* may have lived not on the savannah, however, but in some sort of forest. Mixed in with the hominid fossils, the scientists found thousands of fossilized tree seeds and abundant petrified wood. There were also some 600 specimens from other animals, including such forest dwellers as monkeys, kudu antelopes, bats and squirrels. Notably rare were fossils from grassland beasts like prehistoric horses or giraffes. The theory that *ramidus* was a forest dweller is still not proved, but if it is supported by more fieldwork and analysis, then theorists will have to form a new explanation for the development of erect posture by some apes.

While the evolutionary story is still in some doubt, there is no question about the fossils' antiquity. Ancient bones cannot be dated directly, but geochronologists proceed by determining the age of nearby rocks. It also helps if the fossils have lain undisturbed since they were buried. In this case, the *ramidus* bones could not have been better placed: they were enclosed in sedimentary rock that was neatly sandwiched between layers of volcanic ash, which contains radioactive isotopes that make material easy to date. The volcanic layer just beneath the fossils turned out to be about 4.4 million years old. That jibes perfectly with the ages of other fossil animals found, which were already known from analysis of other sites.

Scientists are debating whether the new hominid is really the common ancestor of both humans and apes, whether it's the first species to appear on the human side after the split or whether there are still several pre-*ramidus* hominids left to be found. Liverpool's Wood thinks White, Suwa and company may have discovered the seminal species. The man who found Lucy in 1974, paleontologist Don Johanson of the Institute of Human Origins, based in Berkeley, California, disagrees. "I still think we're a long way from the common ancestor," he argues. "We're one link closer, just as Lucy was a link closer. There could be room for several more species."

All these issues—bipedalism, the forest-dwelling theory, the question of how high *ramidus* sits in the evolutionary tree—can be settled only with more fieldwork. The team is returning to Ethiopia next month, to the site, hoping to find parts of other skeletons and uncover more clues about the Ethiopian environment of 4.4 million years ago. Says White: "We're going to crawl on our hands and knees, looking for every giraffe, pig, bird, rodent, seed and any other fossil we can find." Humanity has just added half a million years to its heritage; perhaps the next expedition will give scientists a better idea of how much further back our line of ancestors goes. —***Reported by Andrea Dorfman/New York***

■ MEDICINE

The Diabetes Trigger

Compelling new evidence suggests a viral infection could be the culprit

SCIENTISTS HAVE PLENTY OF EVIDENCE that people who develop the most severe form of diabetes harbor a genetic predisposition for the disease. But so far, they have not been able to pinpoint what triggers the deadly illness, in which the body's immune system destroys vital insulin-producing cells in the pancreas. One longstanding hypothesis got a big boost last week when researchers at Children's Hospital of Pittsburgh, Pennsylvania, announced they had discovered compelling evidence that a virus is involved in Type I, or what used to be called juvenile diabetes. In their view, a viral infection causes the immune system to overreact and attack the pancreas. If confirmed, the finding could eventually lead to a vaccine for people with a family history of diabetes.

The investigation grew out of unusually tragic circumstances. On two separate occasions, Dr. Massimo Trucco learned about a teenager who had died within a few weeks of developing diabetes. Trucco asked the parents for permission to perform autopsies, which showed direct evidence of an infection in the pancreas. More to the point, Trucco and colleagues found that the microscopic intruder had triggered an overwhelming immune response much greater than what was needed to subdue the virus. Unfortunately, the pancreas is particularly vulnerable to such an assault, and much of the tissue that produces insulin—a hormone enabling cells to use sugar—had been destroyed.

In effect, Dr. Trucco and his colleagues had caught both the virus and the immune system in their acts of destruction. Had the two patients lived longer, the infection would have subsided—leaving only damaged tissue as an indirect clue that something had gone wrong.

Much work remains before people can benefit from these findings. Researchers have not yet identified the infectious culprit, nor do they know whether the virus is responsible for all Type I diabetes or just for a few unusual cases. But if the Pittsburgh researchers are right, and a vaccine can be developed, the disease could go the way of polio and other childhood scourges conquered by medicine. ■